Rejections Under 35 U.S.C. § 112

Within the Office Action, claims 47-49 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. More particularly, the Office Action stated, "It is not clear from the claim language of the relation applicant has established between the diverging in a first direction, scanning in a second direction, a first scan and a second scan."

Claim 47 establishes the relation between each element recited in the claim. First, claim 47 recites "diverging the fourth laser output in a first direction." Later, claim 47 relates the first direction to the second direction, reciting "the second direction being orthogonal to the first direction." Finally, claim 47 relates the second direction to the first scan and the second scan, reciting "scanning the fourth laser output in a second direction across a portion of a depolarizing screen in a first scan with the first optical path length, in a second scan with the second optical path length." Accordingly, because claim 47 properly recites the relation between "the diverging in a first direction, scanning in a second direction, a first scan and a second scan," claim 47 is allowable.

Additionally, because claims 48-49 dependent from claim 47, they too are allowable as being dependent upon an allowable base claim.

Rejections Under 35 U.S.C. § 103

Scully Combined with Goodman

Within the Office Action, claims 1-10, 12-18, 50-52, 56-58, 63-65, and 67 were rejected under 35 U.S.C. § 103(a) as being unpatentable in light of Scully in view of Goodman. The Applicant respectfully traverses this rejection.

Scully teaches an apparatus for eliminating speckle produced by a laser light reflected from a distant target. The apparatus comprises a half wave plate, two beam splitters, and a totally-reflecting right-angle prism. (Scully, Figure 2) In operation, a laser beam is rotated by passing through the half wave plate and is then transmitted to the first beam splitter, which splits the laser beam into two orthogonal components. (Scully, col. 3, lines 32-51) A first component is transmitted to the second beam splitter, and a second component is reflected to the prism, which transmits the second component to the second beam splitter. (*Id.*, col. 3, lines 52-61) The second beam splitter combines the first and second components into a single beam. (*Id.*, col. 6,

line 61 through col. 4, line 2; Figure 2) Goodman teaches general information on the theory of speckle and ways to eliminate it.

Within the Office Action it is stated that, as to claims 1, 3, 5, 7, 8, 12, 16, and 63, "[o]n page 3 lines 6-12 of the disclosure, as admitted by applicant, Goodman teaches that a 100% depolarizing screen receiving two orthogonal components from a light beam will produce a reduced speckled pattern." The Office Action then concludes that "it would have been obvious . . . to combine the teachings of Goodman of a depolarization screen with the laser system arrangement of Scully because the laser system of Scully would provide the depolarization screen with two orthogonal component light beam[s], which will result in the reduction of the speckle pattern." The Applicant respectfully traverses this conclusion for three reasons.

First, neither Scully nor Goodman, alone or in combination, teaches each element recited in claim 1. Claim 1 recites a single polarizing beam splitter that (1) is "configured to divide a first polarized laser output into a second polarized laser output and a third polarized laser output" and (2) "combines the second polarized laser output and the third polarized laser output into a fourth laser output." This element thus defines a specific structure not taught in Scully, which instead teaches one element (32) to split a vertically polarized beam and a second element (44) to combine the two components of the laser beam. Goodman teaches no specific structures to eliminate speckle, let alone the structure recited in claim 1. Because neither Scully nor Goodman, alone or in combination, teaches the structure recited in claim 1, claim 1 is distinguishable over the combination of Scully and Goodman.

Second, after reading Scully, one skilled in the art would not think to combine it with the depolarizing screen taught in Goodman. Indeed, Scully teaches that a depolarizing screen is unnecessary, stating; "I have concluded that if the speckle intensity distribution depicted in FIG. 1 is changed from that shown by the curve [describing illumination by linearly polarized laser radiation] to that of the curve [describing illumination by unpolarized laser radiation], then the range of (speckle) lobe intensities also is changed, and nulls (i.e., regions of zero intensity) *do not occur*." (Scully, col. 2, lines 55-60, italics added; see also Figure 1). Scully thus suggests that it eliminates speckle, with no advantage to be gained from further combining it with other elements such as the depolarizing screen recited in claim 1.

Third, after reading Goodman, one skilled in the art would not think to combine it with the apparatus in Scully, which separates a laser beam into two orthogonal components. The Office Action suggests that Goodman teaches an advantage in dividing a laser beam into two orthogonal components, and thus provides motivation for doing so. But Goodman suggests nothing of the kind. Indeed, Goodman does not teach that speckle is reduced by illuminating a

surface with orthogonal components that travel different optical paths as recited in claim 1. Instead, Goodman merely states the unremarkable conclusion that any beam has two orthogonal components:

> The irradiance in a speckle pattern is, *of course*, the sum of irradiances contributed by two orthogonal linear polarization components. Hence when the complete depolarization of the reflected wave occurs, the contrast of the total speckle pattern is $1/\sqrt{2}$, rather than unity. (Goodman, page 1147; italics added)

Goodman thus teaches that "reflection from a surface such as a nonglossy paper generally involves multiple scattering, with a considerable amount of depolarization resulting." *Id.* Thus, whenever complete depolarization occurs, the two reflected beams act as two incoherent beams (i.e., two uncorrelated speckle patterns) so that the contrast is $1/\sqrt{2}$. Goodman teaches that uncorrelated speckle patterns can be produced by having a rough surface such that the reflected components are completely uncorrelated. Goodman makes no mention or suggestion to first divide a light wave into orthogonal components that travel different optical paths and to then direct both components onto a nonglossy (e.g., rough) surface.

The Specification does not state otherwise. The Specification states, "The speckle pattern *produced by the depolarizing screen* differs significantly if viewed through a polarization analyzer while rotating the polarization analyzer. This indicates that two orthogonal polarization components illuminating the depolarization screen produced two uncorrelated speckle patterns. Thus, if the viewing screen 6 is a 100% depolarizing screen, the contrast is reduced by $1/\sqrt{2}$." (Specification, page 3, lines 8-12, italics added) The Specification thus paraphrases the section of Goodman quoted above, restating that (1) beams reflected from a depolarizing screen (irradiance illumination) are randomly polarized; (2) speckle (irradiance illumination) has components having various polarizations; (3) that is, an illuminating beam, which has two orthogonal components, thus produces uncorrelated speckle patterns; and (4) if 100% depolarization occurs, then the contrast is $1/\sqrt{(1+1)}$ or $1/\sqrt{2}$. Nothing here teaches first dividing a laser beam into two orthogonal components in order to introduce an optical path difference and then combining the components as recited in claim 1.

For the above reasons, neither Scully nor Goodman provides any teaching, suggestion, or motivation to combine their teachings to produce the apparatus recited in claim 1. Accordingly, claim 1 is allowable. Moreover, because claims 2-15 depend from claim 1, they too are

allowable as depending on an allowable base claim.

Because claim 16 similarly recites producing and combining orthogonal components from a laser output, the components traveling optical paths having different lengths, and illuminating a depolarizing screen, it is allowable for the same reasons that claim 1 is allowable. Because claims 17-18 depend on claim 16, they are allowable as depending on an allowable base claim.

Similarly, claims 50, 56, and 63 recite either a means for or a step of combining a first polarized laser output and a second polarized laser output, which are incoherent and orthogonal; and either a depolarizing screen or the step of illuminating a depolarizing screen. Thus, for the same reasons described above, claims 50, 56, and 63 are allowable. Because claims 51-52 depend on claim 50; claims 57-58 depend on claim 56; and claims 64-65 and 67 depend on claim 63, claims 51-52, 57-58, 64-65, and 67 are allowable as depending on an allowable base claim.

As to claims 4, 6, 9, 10, 17, and 18, the Office Action states that "[o]n page 3 of the disclosure, as admitted by applicant, Goodman teaches that a 100% depolarizing screen receiving two orthogonal components from a light beam will produce a reduced speckled pattern. [¶] It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use a depolarizing screen because it would reduce the speckle pattern as implied by Goodman"

The Applicant respectfully traverses this rejection. Each of the claims 4, 6, 9, 10, 17, and 18 recites either that the depolarizing screen comprises a diffuse reflecting surface or that it comprises a diffuse transmitting surface. The rejection of these claims does not state that either Scully or Goodman teaches this limitation. Accordingly, there is no basis for rejecting claims 4, 6, 9, 10, 17, or 18.

As to claims 13-15, 64, and 65, the Office Action states that Scully teaches splitting a beam into two beams and then recombining them. The Office Action concludes that it would be obvious "to divide and recombine using one beam splitter because the teaching of dividing and recombining to produce a [sic] two orthogonal light beam[s] for reducing speckle pattern via beam splitters is disclosed." The Applicant respectfully traverses this conclusion.

In the rejection it is not explained why a reference that teaches splitting and recombining a light beam using two beam splitter/combiners necessarily teaches a structure that uses one beam splitter/combiner. Indeed, Figure 2 in Scully discloses that the two beam splitter/combiners increase the optical path length traveled by one of the two orthogonal components 210 and 220, increasing the incoherence of the two orthogonal components and thus reducing speckle. Thus, because Scully teaches a structure that uses two beam splitter/combiners

for a supposed advantage, Scully teaches away from the use of a single beam splitter/combiner as recited in claims 13-15, 64, and 65.

As to claims 50, 53, and 56, the Office Action states that "Scully does not disclose the use of multiple lasers. [¶] However, use of multiple lasers would be obvious and involves only routine skill in the art since the requirement to reduce speckle pattern is to combine the beams with orthogonal components, as disclosed by Scully." The Applicant respectfully traverses this conclusion.

Claim 50 recites, in part, "means for combining a first polarized laser output and a second polarized laser output, the first polarized laser output being incoherent with the second polarized laser output, the first polarized laser output and the second polarized laser output having orthogonal polarizations, whereby a third laser output is formed." Contrary to that statement, Scully does not teach, suggest, or provide any motivation for using multiple laser outputs. Instead, as described above, Scully teaches that using one laser output from a single laser is sufficient to eliminate speckle. Moreover, Scully does not teach how to combine multiple laser outputs.

In contrast, the present invention teaches how to eliminate speckle using multiple laser outputs. For example, one embodiment of the present invention, illustrated in Figure 13, teaches an apparatus that uses one laser configured with a laser output having an E field oriented in a p-polarization relative to a polarizing beam splitting reflector and a second laser configured with a laser output having an E field oriented in an s-polarization relative to the polarizing beam splitting reflector. (Specification, page 15, lines 8-12) The Office Action does not explain why "the requirement to reduce speckle pattern is to combine the beams with orthogonal components" would lead to the structure recited in claim 50. Indeed, the requirement to reduce speckle may lead to the use of one beam having orthogonal components, as disclosed in Scully, and not two beams produced, for example, from two lasers. Nothing in the prior art suggests reducing speckle using the apparatus recited in claim 50. Accordingly, claim 50 is allowable over Scully in combination with Goodman.

Because claim 50 recites structure neither taught nor suggested by Scully, claim 50 is allowable for this additional reason. Because claim 53 depends from claim 50, it too is allowable for this additional reason.

Claim 56 recites similar structure in a method claim: "combining a first polarized laser output and a second polarized laser output to form a third laser output, the first polarized laser output being incoherent with the second polarized laser output, the first polarized laser output and the second polarized laser output having orthogonal polarizations." Accordingly, for the

same reasons described above, claim 56 is allowable over Scully in combination with Goodman.

As to claims 51, 52, 57, and 58, the same statements are asserted to reject these claims as were asserted to reject claims 4, 6, 9, 10, 17, and 18. Like claims 4, 6, 9, 10, 17, and 18, claims 51, 52, 57, and 58 also recite either that the depolarizing screen comprises a diffuse reflecting surface or that it comprises a diffuse transmitting surface. Thus, for the same reasons offered above with respect to claims 4, 6, 9, 10, 17, and 18, claims 51, 52, 57, and 58 are also allowable.

Thus, for the reasons given above, claims 1-10, 12-18, 50-52, 56-58, 63-65, and 67 are allowable over Scully combined with Goodman.

Scully Combined with Hill and Goodman

Within the Office Action, claims 59, 60, and 62 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Scully in view of Hill and Goodman. The Applicant respectfully traverses this rejection.

Claim 59 recites, in part, "means for rotating a polarization of a laser output, whereby a rotating polarization is formed, the rotating polarization being driven with a rotation frequency." Rotating polarization is described with respect to one embodiment of the present invention on page 17, at lines 10-16 of the Specification:

> The polarization rotator 142 rotates a polarization of the first polarized laser output 146 to form a ninth laser output 146 having a rotating polarization. The ninth laser output illuminates the depolarizing screen 42. The ninth laser output 146 having the rotating polarization produces the four uncorrelated speckle patterns. Provided that a rotation frequency is sufficient, the eye or the intensity detector averages the four uncorrelated speckle patterns and, thus, the eye or the intensity detector detects the reduced speckle.

In contrast, Hill teaches an apparatus that "transforms a single frequency, linearly polarized laser input beam from a light source into an output beam having two collinear orthogonally polarized output beam components differing in frequency from each other by the frequency of a stabilized electrical signal provided from an electronic oscillator." (Hill, Abstract, reference numeral omitted) The text accompanying the description of Figure 2 in Hill, which traces the two output beams generated from the one input beam, merely states that the output beam is "composed of the two beam components (32) and (33) which are collinear, orthogonally polarized, and differ in frequency by f_0." (*Id.*, col. 9, lines 57-59) The frequency referred to in Hill is thus a frequency difference between two beam components, not a "rotation frequency"

with which the means for rotating recited in claim 59 is driven. Thus, Hill does not disclose a "means for rotating a polarization of a laser output."

Thus, the combination of Scully, Goodman, and Hill does not teach a "means for rotating a polarization of a laser output" as recited in claim 59. For at least this reason, claim 59 is allowable over the combination of Scully, Goodman, and Hill. Furthermore, because claims 60 and 61 depend on claim 59, they too are allowable as being dependent on an allowable base claim.

Allowable Subject Matter

Within the Office Action, "[c]laims 11, 44-49, 54, 55, 61, 66, and 68 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims."

As described above, independent claim 1 is allowable and thus its dependent claim 11 is allowable. Independent claim 44 is allowable and thus its dependent claims 45-46 are allowable as being dependent on an allowable base claim. Independent claim 47 is allowable, and thus its dependent claims 48 and 49 are allowable. Independent claim 50 is allowable, and thus its dependent claims 54 and 55 are allowable.

As described above, independent claim 59 is allowable. Thus, its dependent claim 61 is allowable. Finally, as described above, independent claim 63 is allowable. Thus, its dependent claim 66 is also allowable.

The Office Action also states that "[c]laims 47-49 would be allowable if rewritten or amended to overcome the rejections(s) under 35 U.S.C. 112, second paragraph, set forth in this Office Action." As discussed above, because claim 47 adequately recites the relation between its elements, the rejection of claim 47 under 35 U.S.C. § 112, second paragraph, is improper. Accordingly, claim 47 is allowable. Because claims 48-49 depend from claim 47, they too are allowable as depending from an allowable base claim.

CONCLUSION

For the reasons given above, the Applicant respectfully submits that the claims are now in condition for allowance, and allowance at an early date would be appreciated. If the Examiner has any questions or comments, he is encouraged to call the undersigned at (408) 530-9700 to discuss them so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
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Dated: 10-22-02

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CERTIFICATE OF MAILING (37 CFR § 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Assistant Commissioner for Patents, Washington D.C. 20231

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Date: 10-22-02 By: Jason D. Rusion